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INTERPRETING THE VERTICAL DISTRIBUTION OF STONE POINTS WITHIN NAUWALABILA 1, ARNHEM LAND.

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ABSTRACT

A strong positive relationship between the number of artefacts and point frequency in the Nauwalabila 1 archaeological deposit can explain the vertical distribution of bifacial points in Arnhem Land. Investigations of the timing of point introduction should incorporate an understanding of such sample-size effects and studies of the technological characteristics of flakes.

KEYWORDS: Nauwalabila, Northern Territory, bifacial point, archaeological dating, Small Tool Tradition, chronological resolution, post-depositional movement.

INTRODUCTION

Ever since Etheridge and Whitelegge (1907) identified the implement class now called backed blades and noted that it is truly prehistoric, Australian archaeologists have sought to determine the date at which such precisely flaked stone artefacts were made and used. In addition to backed blades, several other implement classes (including points and tulas), lumped together under the leaking umbrella of the "Small Tool Tradition", have been investigated. Much effort has been spent on identifying the date at which those implements first appeared in Australia (e.g. Bowdler and O'Connor 1991; Johnson 1979; Jones and Johnson 1985; Pearce 1974). Although there is general agreement that the appearance can be broadly placed in the mid-Holocene, some scholars insist that it was less than 4,500 years BP, while others argue for an introduction more than 5,000 years ago. The most recent manifestations of this debate focus on the vertical distribution and radiocarbon dating of bifacial points in an Arnhem Land rockshelter, Nauwalabila 1. At this site, various observations of the vertical distribution of points within the sandy deposit have led to contrasting inferences about the antiquity of points in northern Australia (e.g. Bowdler and O'Connor 1991; Jones and Johnson 1985). This paper evaluates the competing explanations by investigating the relationship between point frequency and the size of archaeological samples.

BACKGROUND

At the heart of the controversy is the vertical distribution of points located by Rhys Jones during excavations at the Nauwalabila 1 site in 1981. Jones and Johnson (1985:194) found that points were concentrated in spits 10-17, but that they also occurred in spits 3 and 27. Between spits 3 and 9, and between spits 17 and 27, no points were recovered, giving the appearance of three separate clusters within the deposit (Fig. 1). Jones and Johnson (1985:202) argued that points had been in use at the site during all periods of occupation represented by levels above spit 27, but points were not found in every spit because of ". . . the vagaries of the unpredictable occurrence of rare objects within small samples". They therefore concluded that a radiocarbon analysis of charcoal from spit 27, of 5860±90 years BP (ANU-3180), provides a date for the introduction of points at this site, and by implication elsewhere in northern Australia. Change in the size distribution of quartzite flakes in spits 27-29 was employed by Jones and Johnson (1985:206) to reinforce a picture of general technological change. They stated:

> "What changed at Unit 27 in this site was the entire technological system of flaked stone tool manufacture. This was when it first became geared to the manufacture of bifacial stone points."

This explanation for point distribution has been rejected in its entirety by Bowdler and O'Connor (1991), who instead invoke post-depositional vertical movement for those points outside the main concentration of spits 10-17, and especially for the single point recovered from spit 27. In dismissing claims for high stratigraphic integrity and by emphasising the loose nature of the sandy sediments, Bowdler and O'Connor (1991:56) follow a well-established theme in Australian archaeology where specimens distinctive of the Small Tool Tradition are found substantially below the levels at which they might 'normally' be expected; the most likely cause is a downward displacement from their original context (see also Stockton 1973; Hughes and Lampert 1976; Johnson 1979). Consequently, Bowdler and O'Connor (1991:56) state that the recovery of a point from spit 27 at Nauwalabila:

> "...is exactly the kind of situation obtaining in other sites, where early dates have been queried, where there is as it were a large reservoir of artefacts with a 'trickle' below it."

Bowdler and O'Connor therefore discount the specimen in spit 27 for the purpose of dating the introduction of points, and consider only the concentration of points in spits 10-17, thereby

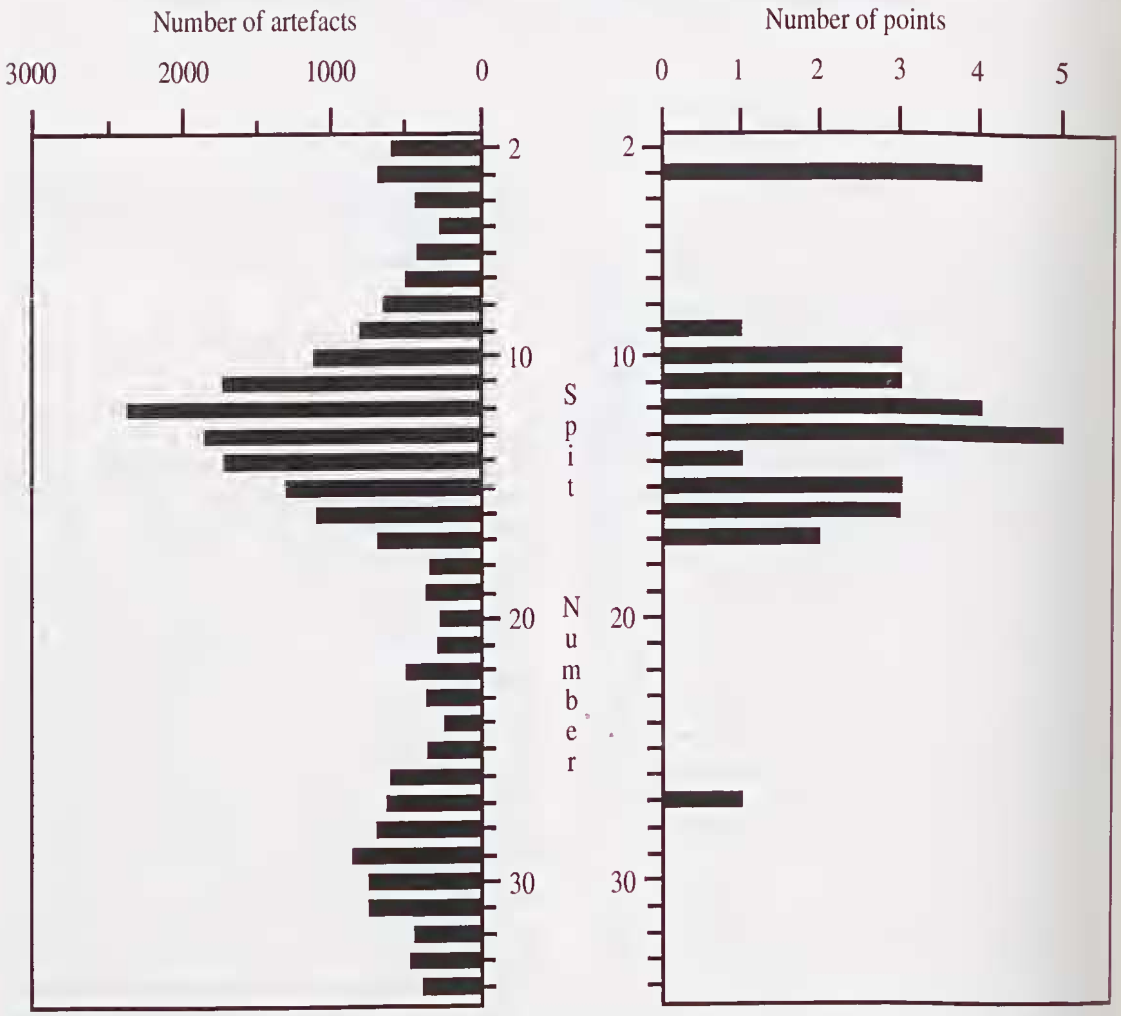

Fig. 1. Comparison of vertical sequences for total artefact assemblages and points within squares K28, K29, L28, and L29 at Nauwalabila 1.

placing the antiquity of point manufacture at Nauwalabila 1 at less than 4,000 years. Implicit in this model is the idea that the failure to recover points in spits 18-26 reflects the real absence of points during the occupation represented by those levels. Such a chronology then fits neatly with the timing of changes elsewhere in Australia, including the sequence from the Widgingarri Shelters in the West Kimberley region. At Widgingarri Shelter 2, the lowest point came from a level (spit 8) associated with a radiocarbon date of 4660±60 years BP (Wk1398) (Bowdler and O'Connor 1991:60). Bowdler and O'Connor suggest that this is a date that more reliably marks the appearance of points in Australia.

DISCUSSION

Evaluating the extent of post-depositional movement at Nauwalabila 1 is difficult on the evidence currently available. Jones and Johnson (1985:201) accept that vertical movement in the order of 5-8cm may have occurred at the top of the deposit, as indicated by glass in spit 3, but are reticent to concede post-depositional movement of greater magnitude. However, even this amount of movement would be significant for the debates over the timing of point introduction. The lower-most point, in spit 27, is a mere 5 cm below charcoal in spit 24 giving a radiocarbon estimate of 4040±100 years BP (ANU-3178), and could therefore be explained away as having 'trickled' downwards (Bowdler and O'Connor 1991:56). It will not be possible to know whether such movement occurred in this site until specific analyses, such as artefact conjoining, are undertaken. Regardless of the degree of vertical movement that may have occurred, Bowdler and O'Connor were rash to disregard the contribution of sample-size to the pattern of point distribution.

Fortunately, Jones and Johnson provide enough raw data to evaluate the hypothesis that the distribution of points reflects sampling factors, and specifically the notion that sample-size affects the likelihood of spits containing rare artefact forms such as points. Figure 1 compares the frequency of points and the frequency of all stone artefacts throughout the top 110cm of the Nauwalabila 1 deposit in squares K28, K29, L28, and L29 (data from Jones and Johnson 1985). The histogram of artefact numbers appears to be trimodal, with peaks at spits 3, 12, and 29 separated by troughs, in spits 4-8 and spits 18-25, where there are less than 500 artefacts per spit. The distribution of points throughout the deposit shows remarkable similarity to the fluctuations in artefact numbers. A cluster of spits 10-17, containing numerous points, clearly coincides with the extremely high artefact densities occurring in those levels, and the points found in spits 3 and 27 are also coincident with artefact sample sizes greater than 500. Thus, even in the simple pictorial display presented in Figure 1, there is a connection between the frequency of points and the size of artefact assemblages, with no points being found in spits with fewer than 500 artefacts.

The strength of this relationship is clear when the number of points and the number of artefacts from each spit is plotted directly against each other (Fig. 2). A distinct positive relationship is visible between these two variables, and can be measured by the r^2 value of 0.86 for a linear correlation of mean values. Much of the vertical variation in point abundance is therefore explicable in terms of sample size!

The equation for the line of best fit drawn in Figure 2, $y = 0.004x - 1.93$, confirms the notion that only spits containing in excess of 500-800 artefacts are likely to contain any points, and the larger the number of artefacts in the spit the more points are likely to be present. The regularity of the relationship is interesting, and suggests that a more usable formulation of point distribution can be given than merely referring to the "vagar-

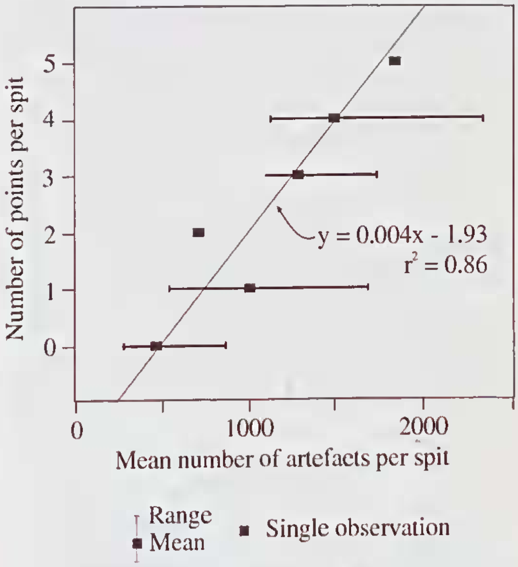

Fig. 2. Graph showing the relationship of spit sample size and point frequency for squares K28, K29, L28, and L29 at Nauwalabila 1.

ies of the unpredictable occurrence" as has been done previously. However, the major concern of the debate between Jones and Johnson (1985) and Bowdler and O'Connor (1991) is not the abundance of points in any spit, but their presence or absence. To clarify that issue it is possible to describe the effect of sample size on point frequency in another way, by calculating the percentage of spits that contain points for each of a number of classes of sample size (Fig. 3). When this is done, it is apparent that in Nauwalabila I all samples greater than 1,200 contain points, two-thirds of the samples with 800-1,200 artefacts have points, only a quarter of samples with 400-800 artefacts have points, and none of the samples smaller than 400 have points.

The message is simple. At Nauwalabila I there is a strong relationship between the number of artefacts in any spit and the number of points that will be recovered. Of course it is theoretically possible to excavate a spit that contains only one artefact, and that a point, but it is not very likely (about 1 in 500). On most occasions, spits containing less than 500-800 artefacts per square metre will yield no points even if points were in use when that level was deposited. This is sufficient to explain the absence of points in spits 4-8, 18-26, and 28-34 (Fig. 1). Spits containing 500-1,200 artefacts per square metre will not necessarily contain points, even if points had been in use, but on some occasions points will be present. This would explain the presence of points in spits 27, 17, 16, 10, 9 and 3 (Fig. 1). Finally, in all spits containing more than 1,200 artefacts per square metre it is highly likely that points will be found, and they are likely to occur in large numbers. This would explain the relatively high frequency of points in spits 11-15 (Fig. 1).

These statements do not preclude the notion that vertical movement may have taken place at Nauwalabila I, or that such movement might in part be responsible for the vertical patterning of points. However, it is not necessary to invoke post-depositional movement to account for the pattern of points, since this can be achieved by reference to the effects of sample sizes. This interpretation generally supports the arguments of Jones and Johnson (1985) that the recovery of points could simply be related to sampling phenomena, and implies that any discussion of vertical distribution must incorporate not only a consideration of taphonomic factors but also those of sampling. A number of important implications that have not been previously considered arise from this reasoning.

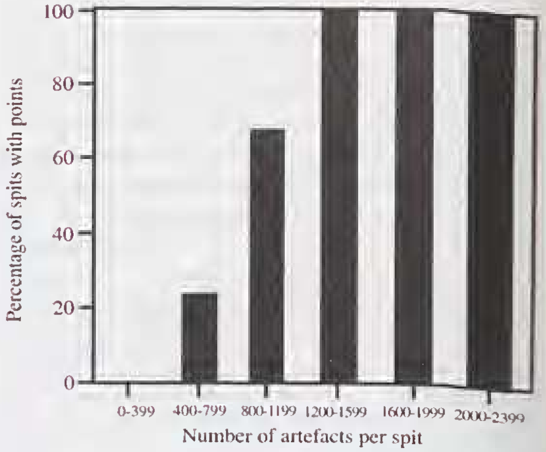

Fig. 3. Frequency with which points are present in different assemblage sizes at Nauwalabila I.

First, in view of the sample-size effects discussed here the chronological resolution available at Nauwalabila I is partly dependent on the excavation strategy, and not entirely intrinsic to the archaeological record as Jones and Johnson (1985:201) imply. The total number of artefacts recovered from each spit, and hence the probability of finding points, will be influenced by not only the size of excavation units but also the number of excavated squares and the recovery methods. Jones and Johnson (1985:201) claim that Nauwalabila I provided unusually good resolution partly because there was "... a sufficient number of stone points per unit volume of deposit to allow statistical treatment of the finds..." Nonetheless, any deposit might be capable of yielding a usable vertical sequence if sufficient volume were excavated, and Nauwalabila I is still subject to sample-size effects in spite of the point density. Resolution will be maximized only when excavation strategy is tied to specific research questions.

Secondly, and more importantly, the lowest point recovered at Nauwalabila I need not represent the first time that such objects were manufactured or used, merely the first instance of discard within the boundaries of the excavated area. The probability of point discard, and therefore presence, has already been shown to relate to sample size, and at Nauwalabila I the density of artefacts in the deposit below spit 27 is generally low in comparison with higher levels. Indeed it is possible that points may have been in use well before their appearance in spit 27 but have not been recovered by archaeologists because of small assemblage sizes at those levels. Leaving aside the possibility of post-depositional movement, the lowest point may give us a minimum age for that implement type. Similar conclusions have been drawn by Hughes and Djohadze (1980) in the context of backed blade recovery in southern Australia. Parallel arguments could be made for other sites in northern Australia where points have been dated, including the Widgingarri sites quoted by Bowdler and O'Connor (1991). Since mid- Holocene levels in Australian sites typically have lower artefact densities and discard rates than late Holocene levels (cf. Hiscock 1986) it will be common for this sample-size effect to create uncertainty about the timing of the initial appearance of artefact types such as points and backed blades.

This reasoning brings the poor quality of supporting evidence into sharp focus. Both Bowdler and O'Connor (1991:59) and, more expansively, Jones and Johnson (1985:203-206), search for a validation of their inferences by reference to the size classes of unretouched flakes at various levels of the deposit. The proposition they employ is that morphological change in the manufacturing debris is expected to accompany the introduction of point production; a proposition that seems well founded. Identifying the lowest levels within a deposit which contains flakes removed in making points would therefore be a valid means of identifying the introduction of points. This may be a more robust approach than hunting for the points themselves, since the more numerous flaking debris should be less sensitive to sample-size effects. In theory, detailed study of unretouched flakes therefore seems to offer hope for resolving the debate over the timing of point production.

In practice, the studies of flakes at sites such as Nauwalabila I are too crude to be used as indicators of technological change. The covariation between changing flake sizes and the presence of points through the sequence that Jones and Johnson (1985:203-206) emphasise is only rough, with change in the former consisting of a gradual trend. It would be possible to argue that the major changes in flake size occur at either higher or lower levels in the deposit than those in which points were recovered (cf. Bowdler and O'Connor 1991:60). More significantly, other assemblage changes take place in the same levels of the deposit that points first appear (i.e. spits 25-30). For example, "generalised scrapers", "steep-edged scrapers" and cores decline in frequency (Jones and Johnson 1985:196), and non-local chert is gradually replaced by locally-available quartzite that may suggest a variety of alterations in procurement and manufacturing behaviour that might affect flake size. There is no reason to assume that a diminution in flake size necessarily reflects a technological change towards point production. Consequently, while the examination of unretouched flakes is a sensible means of recognizing technological change, the identification of those changes that are specifically related to the introduction of point manufacture would require a more sophisticated attribute analysis, involving the characterisation of biface thinning flakes through indices of flake shape rather than size.

CONCLUSION

An examination of the data on the vertical distribution of stone points in the Nauwalabila I archaeological site leads to the following conclusions:

1. A strong positive correlation between the number of artefacts per spit and point frequency exists for the upper metre of the Nauwalabila I deposit. This relationship can explain the vertical distribution of bifacial points without reference to post-depositional vertical movements.
2. Sample-size effects should be investigated in all archaeological enquiries into the vertical distribution of rare artefact types such as points, and the effects considered in conjunction with evidence for post-depositional movement.
3. Examinations of the technological characteristics of flakes are more likely to be successful in identifying the kinds of artefact manufacturing that occurred in any level of a deposit than are identifications of only the recognisable implement types.

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REFERENCES

Bowdler, S. and O'Connor, S. 1991. The dating of the Australian Small Tool Tradition, with new evidence from the Kimberley, W.A. *Australian Aboriginal Studies* **1991/1**:53-62.

Etheridge, R. and Whitelegge, T. 1907. Aboriginal workshops on the coast of New South Wales, and their contents. *Records of the Australian Museum* 6:233-250.

Hiscock, P. 1986. Technological change in the Hunter River Valley and its implications for the interpretation of late Holocene change in Australia. *Archaeology in Oceania* **21**:40- 50.

Hughes, P.J. and Djohadze, V. 1980. Radiocarbon dates from archaeological sites on the south coast of New South Wales and the use of depth/age curves. *Occasional Papers in Prehistory*:1-33. Department of Prehistory, Australian National University.

Hughes, P.J. and Lampert, R.J. 1976. Occupational disturbance and types of archaeological deposit. *Journal of Archaeological Science* **4**:135-140.

Johnson, I. 1979. The getting of data. Unpublished doctoral thesis, Australian National University.

Jones, R. and Johnson, I. 1985. Deaf Adder Gorge: Linder Site, Nauwalabila 1. In: Jones, R. (ed.) *Archaeological Research in Kakadu National Park*. pp.165-228. Australian National Parks and Wildlife Service, Canberra.

Pearce, R.H. 1974. Spatial and temporal distribution of Australian backed blades. *Mankind* 9:300-309.

Stockton, E.D. 1973. Shaw's Creek Shelter: human displacement of artefacts and its significance. *Mankind* 9:112-117.

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